№ 13047

INVOLVING EVERYONE IN SCIENCE EDUCATION: A LOOK AT THE BAY AREA EARTH SCIENCE INSTITUTE'S EDUCATIONAL PARTNERSHIP PROGRAM.

GEARY, Edward E., and METZGER, Ellen P., Department of Geology, San Jose State University, San Jose, CA 95192-0102.

To significantly improve scientific literacy in the 1990s and beyond requires the establishment of long term educational partnerships between academic, business and government agencies. In the summer of 1990 the Bay Area Earth Science Institute began this process by bringing together secondary school science teachers and earth science experts from around the San Francisco Bay Area in an intensive four-week workshop at San Jose State University.

Industry and government partners in the first year's program included: Chevron USA, the California Mining Association, Apple Computer, Inc., Leslie Salt Company, Kaiser Cement, Addison Wesley, Pacific Gas and Electric, the National Science Foundation, the United States Geological Survey, the NASA-Ames Research Center, the Marine Science Institute, the California Division of Mines and Geology, and the Environmental Protection Agency. Academic partners in the program included San Jose State University and over a dozen school districts from as far north as San Francisco and Sacramento to as far south as Bakersfield. Partner contributions to the program ranged from financial and materials donations, to cost-sharing of field trips, to the direct participation of teachers, and government and industry scientists as speakers and field trip leaders.

Evaluations of the first summer program indicate that teachers benefit from intensive partnership programs by (1) increasing their knowledge of earth science processes and concepts, (2) developing and sharing hands-on activities, (3) acquiring new classroom materials, and (4) interacting directly with local scientific and industry experts. Industry and government participants benefit by an increased knowledge of the needs of secondary school science teachers, and positive community outreach.

№ 6912

RE-EVALUATION OF A 'BLISTERING' PLUTON: POST-EMPLACEMENT REGIONAL DEFORMATION AT THE CRETACEOUS PAPOOSE FLAT PLUTON, WHITE-INYO MTS., CAL.

GODIN, Paul D.; PATERSON, Scott R., Dept. Geology, Univ. Southern Cal., Los Angeles, CA, 90089-0740.

Previous work on the Papoose Flat pluton indicated that most of the solid-state deformation (including foliation and a high degree of stratigraphic attenuation) was due to westward blistering of the pluton. A strong component of top-to-SE sinistral shear has recently been recognized by several workers, including the authors. Present evidence, however, suggests that much of the deformation around the pluton is the result of post-emplacement folding and faulting.

Field evidence incompatible with the blistering model includes: 1) A NW-trending shallow-plunging stretching lineation that has a strongly consistent orientation over the entire pluton and nearby wall rocks, and is best developed in areas that would have experienced oblate strain in the blistering model; 2) A lack of major compositional or textural zonation in the pluton; 3) Major upright folds with NW-SE trending fold axes at high angles to the pluton. Steep NW-striking cleavages seen in both the pluton and the wall rock over much of the map area may be axial-planar; 4) Bedding and foliation are often oblique; 5) Lack of any magmatic foliation; 6) S-C relationships consistently indicating sinistral top-to-SE shear. Limestone and metasiltstones beyond the contact aureole also show the same strong S-C fabric.

Porhyroblast-matrix relationships in the contact aureole reveal that at least three generations of cleavage are present in the wall rocks, with the latest dominant foliation (containing the lineation) being syn-to-post contact metamorphism or clearly post-contact metamorphism.

A post-emplacement regional deformation, with a gradient of strain decreasing from NW to SE, and from the pluton margin both inwards and outwards, would account for the field and laboratory observations noted.

№ 2395

MODELS AND METHODS FOR TEACHING EARTH SCIENCE AT THE MIDDLE SCHOOL LEVEL.

GOLDBERG, Marsha Bowman, New Haven Middle School, Hop Ranch Road, Union City, CA 93657.

Earth Science is often ignored or skimmed over at the middle school level. Teachers lack training and resources to put together a strong program. The Bay Area Earth Science Institute (BAESI) gave me the opportunity to enrich my Earth Science curriculum. Lectures by research scientists increased my background knowledge. Exchange with teachers during the summer and throughout the school year provided a valuable resource for my enriched curriculum.

My goal is to interest kids by teaching a hands-on activity based program that is process oriented. I relate lab activities to today's world and insist that they be meaningful. All subject areas are integrated when appropriate. Field trips are taken to enhance the learning experience. Earth, Physical, and Biological Science topics are woven through the year-long program so that students develop a conception of the inter-connectedness of our world.

№ 16148

NEW EVIDENCE FOR WIDESPREAD FLUID FLOW AND GOLD DEPOSITION IN SOUTHEAST ALASKA AT 55 MA

GOLDFARB, R.J. and SNEE, L.W., U.S.G.S., Box 25046, Denver Federal Center, Denver, CO 80225; MILLER, L.D., Echo Bay Mines, 3100 Channel Drive, Juneau, AK 99801; NEWBERRY, R.J., Dept. of Geology and Geophysics, U. of Alaska, Fairbanks, AK 99775

Mesothermal gold-bearing quartz veins of the Juneau gold belt occur for 200 km along the northern part of the steeply-dipping Coast Range megalineament. These deposits have been responsible for 6.7 million oz of gold production and have estimated reserves of at least 3 million oz. Dating of hydrothermal sericite from four of the major deposits indicates a remarkably brief period for much of the ore formation. Measured apparent ages, which are statistically identical, are 55.1 ±0.2 Ma (Ar-Ar) for the Sumdum Chief deposit at the southern end of the belt, 55.3 ±1.7 Ma (K-Ar) for the Alaska-Juneau deposit and 55.1 ±0.2 Ma (Ar-Ar) for the Treadwell deposit at the center of the belt, and 55.5 ±0.3 Ma (Ar-Ar) for the Jualin deposit at the northern tip of the belt. The generally northwest-striking auriferous veins, which are common to most major deposits in the gold belt, thus developed during the oblique convergent regime that characterized southeast Alaska in the early Eocene.

The isotopic dates suggest that mesothermal gold veins may form essentially simultaneously over great distances along major crustal shear zones. Earlier fluid inclusion and stable isotope studies have shown that the ore fluids along the Juneau gold belt probably originated as a result of prograde metamorphism of accreted terranes. The combination of metamorphic devolatilization reactions and a regime of regional horizontal compression probably led to the development of supralithostatic fluid pressures at depths of at least 5-8 km. An episode of faulting and seismic activity at about 55 Ma resulted in a short-lived tensional event across much of southeastern Alaska that allowed upward fluid flow and emplacement of gold veins. This scenario is most consistent with the fault valve theory of Sibson (1990); this work also postulates that a single major seismic event ($M \geq 7.5$) could rupture the crust over a length as great as that of the Juneau gold belt. The seismogenic event at 55 Ma may additionally have been significant in the development of the Coast Range megalineament itself.

№ 9349

NEOTECTONICS AND STRIKE-SLIP FAULTING IN THE CASCADIA SUBDUCTION ZONE OFF OREGON AND WASHINGTON

GOLDFINGER, Chris, Department of Geosciences, Wilkinson Hall 104, Oregon State University, Corvallis, OR 97331; KULM, L. D., College of Oceanography, Oregon State University, Corvallis, OR 97331; YEATS, R. S., Department of Geosciences, Wilkinson Hall 104, Oregon State University, Corvallis, OR 97331

Detailed study of the northern Oregon and southern Washington margin using sidescan sonar surveys, SeaBeam bathymetry, and single/multichannel seismic records show surficial and basement faults transverse to the N-S trending accretionary wedge thrusts, and extend into the adjacent abyssal plain. Four NW-trending faults (A, B, C, and D) intersect the deformation front between 44° 30'N and 45° 20'N. The best known fault (A) extends more than 17 km seaward of the front, offsets sub-bottom reflectors approximately 100 m (NE block up), and may offset the basement approximately 200 m vertically. Late Pleistocene to Holocene seafloor channels are offset 150-400 m in a left-lateral sense. Strike-slip faulting is also indicated by flower structures, mismatched acoustic stratigraphy, and reversals of vertical separation along trend. These structures are inferred to be active from direct submersible observation of fresh scarps and fluid venting on the sea floor. Fault A corresponds to a lineation observed on GLORIA sidescan images; it may extend 38 km seaward of the deformation front. Faults B, C, and D are associated with left offsets of the deformation front and/or left offsets of fold axes on the continental slope. Two faults (A, B) are associated with north-plunging, pressure ridge anticlines formed across right steps in their traces. Using seismic records and SeaBeam bathymetry, faults A, B, and C can be traced 120 km landward of the deformation front, SE across the continental slope and onto the shelf. Faults A and B project onshore near Yaquina and Alsea bays, respectively. Several more strike-slip faults on the northern Oregon and southern Washington slope and shelf are under investigation. Present evidence indicates that more NW trending, left-lateral strike-slip faults crosscut accretionary wedge structures on the southern Washington slope and shelf. One of these faults projects onshore at the mouth of the Columbia River, and may exert a structural control on the location of Astoria canyon. The left-lateral faults may be R' rotational shears induced by oblique subduction of the Juan de Fuca Plate.

№ 20458

INNOVATIVE EDUCATION PROGRAMS OF THE U.S. GEOLOGICAL SURVEY'S WESTERN REGION

GORDON, Leslie C., U.S. Geological Survey, 345 Middlefield Rd., MS 919, Menlo Park, CA 94025

As the Nation's leading earth science research agency, the U.S. Geological Survey is in an ideal position to contribute to precollege earth science education. The Survey has, in fact, been involved with education to varying degrees for more than 100 years, and the past several years have brought an additional surge in educational efforts. What has evolved over the years is a loosely structured, multifaceted program that continues to grow and change. Contrary to popular opinion about the rigidity of government bureaucracies, it is precisely the flexibility of the Survey that has contributed to the success of our efforts in earth science education. Nearly all of the Survey's educational services and activities are closely tied to the talents and interests of the individuals involved. The Survey has very few nationally oriented educational programs; only our publications and the Teacher's Packet are available by mail to educators nationwide. However, many local projects and programs are going on across the U.S., and the focus of these programs varies greatly in different regions.

The Western Region Education Program has many components, including: 1) Inservice and preservice teacher training and workshops; 2) Classroom visits by